Variable stars in the globular cluster M 79

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Abstract We present preliminary results obtained from analysis of the *VI* photometry of the globular cluster M 79. Stellar variability survey performed with the image subtraction method yielded six new pulsating stars: two of RR Lyrae type, three SX Phoenicis stars and even one W Virginis star. Using all eleven RR Lyrae stars known in the cluster we find that M 79 is Oosterhoff type II globular cluster.

1 Introduction, Observations and Results

In the last two decades we observed a rapid increase in the number of variable stars detected in Galactic globular clusters. The main reason for this was the invention of the image subtraction method (ISM, [1]) and its application to CCD data obtained with small telescopes (e.g. [3]). The ISM enables making a complete inventory of bright variable stars, such as RR Lyrae variables, because it works well in crowded stellar fields like the cluster core. However, there are still many globular clusters poorly searched for variable stars, especially pulsating stars of the RR Lyrae and SX Phoenicis types.

Here we present results of a variability analysis for the southern globular cluster M 79 (NGC 1904) of intermediate metallicity ([Fe/H] = -1.57). The Catalogue of Variable Stars in Globular Clusters (CVSGC, [2]) listed 13 objects in the field of this cluster including nine RR Lyrae stars, one semiregular variable and three stars suspected for variability.

We used two sets of observations. The first one consisted of 690 V-filter and 230 I_{C}-filter CCD frames obtained during one-month observing run in Feb/Apr, 2008 using 40-inch telescope at SSO, Australia. The other one included 80 V-filter

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CCD frames acquired during one week of observation in Apr, 2008 using 40-inch telescope at SAAO, South Africa.

We have detected two new RR Lyrae stars, both of the RRc type. The mean period of RRab stars in M 79 is equal to $\langle P \rangle_{ab} = 0.69$ d, and relative percentage of RRc stars amounts to $N_c/(N_{ab} + N_c) = 44$ %. With these values we conclude that M 79 belongs to the Oosterhoff's II group of globular clusters.

We show that v7 is a W Virginis-type star. Moreover, three SX Phoenicis stars were found among cluster's blue stragglers. One of them, n18, and RRc star v9 are multiperiodic pulsators. The period ratio for n18 indicates that this SX Phoenicis star is a double-mode radial pulsator. Positions and periods of all observed periodic stars are given in Table 1. Irregular light variations were also found in a dozen of red giants located at the tip of the cluster's red giant branch.

Table 1 Equatorial coordinates and periods for periodic stars in M 79

Var	α_{2000} [^{h} ^{m} ^{s}]	δ_{2000} [$^\circ$ $'$ $''$]	P [d]	Type
v3	5 24 13.54	−24 32 29.1	0.73602	RRab
v4	5 24 17.77	−24 32 16.2	0.63339	RRab
v5	5 24 10.23	−24 31 03.6	0.66894	RRab
v6	5 24 06.03	−24 29 32.9	0.339065	RRc
v7	5 24 12.68	−24 31 41.9	13.946	W Vir
v9	5 24 12.58	−24 31 52.6	0.37905	RRc
			0.36099	
			0.37049	
v10	5 24 12.13	−24 31 34.5	0.72894	RRab
v11	5 24 11.93	−24 31 34.6	0.8232	RRab
v12	5 24 11.35	−24 31 28.3	0.32394	RRc
v13	5 24 10.59	−24 31 11.5	0.68931	RRab
n14	5 23 23.74	−24 27 46.3	0.309058	RRc
n15	5 24 07.77	−24 31 00.3	0.323758	RRc
n16	5 24 09.97	−24 31 07.3	0.038763	SX Phe
n17	5 24 14.15	−24 33 20.7	0.044803	SX Phe
n18	5 24 10.86	−24 31 11.8	0.050276	SX Phe
			0.039169	

References

1. Alard, C., Lupton R.H.: A Method for Optimal Image Subtraction. ApJ **503**, 325 (1998)
2. Clement, C.M., et al.: Variable Stars in Galactic Globular Clusters. AJ **122**, 2587 (2001)
3. Kopacki, G.: Search for Pulsating Stars in the Globular Cluster M 80 from Ground- and Space-based Observations. AIPC **1170**, 194 (2009)